

Limited Soils Investigation Pavement Design Recommendations Reconstruction of Francisco Street Western Avenue to Harborgate Way

Los Angeles, California

Prepared For:
Boeing Realty Corporation
4060 Lakewood Boulevard, 6th Floor
Long Beach, California 90808-1700

Attn: Mr. Stephen Bisset

Project Number 5936-96 July 13, 1998

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS 10641 HUMBOLT STREET LOS ALAMITOS, CA 90720 (562)799-9469 FAX (562)799-9459

July 13, 1998

Project Number 5936-96

Boeing Realty Corporation 4060 Lakewood Boulevard, 6th Floor Long Beach, California 90808-1700

Attn: Mr. Stephen Bisset

RE: Limited Soils Investigation - Pavement Design Recommendations - Proposed Reconstruction of Francisco Street, from Western Avenue to Harborgate Way, in the City of Los Angeles, California

Dear Mr. Bisset:

Pursuant to your request, this firm has performed a Limited Soils Investigation for the above referenced project in accordance with your authorization. The purpose of this investigation is to evaluate the geotechnical conditions of the proposed roadway area and provide recommendations for the proposed pavement section. This geotechnical engineering report presents the finding of our study along with conclusions and recommendations for development.

Site Description

The proposed roadway area is currently covered with an existing paved access road and asphaltic parking and storage areas. Pavement in the area is in relatively good condition, however several areas have experienced some distress over the years.

Field Investigation

The purpose of the investigation was to explore the subsurface conditions and to provide preliminary geotechnical engineering design parameters for evaluation of the site with respect to the proposed improvements.

The investigation consisted of the placement of three subsurface exploratory excavations by hollow-stem auger to a maximum depth of 10 feet placed in the proposed roadway area. The explorations were visually classified and logged by a field engineer with locations of the subsurface explorations shown on the attached Site Plan. The exploratory borings revealed the existing earth materials to consist of fill and natural soil zones. A detailed description of the subsurface conditions are listed on the boring logs in Appendix A. These soils are described as follows:

Fill: Fill soils generally classifying as silty, sandy CLAY with occasional gravel were encountered in all borings. Fill soils ranged in depth from 4 inches to 2 feet and were generally noted to be stiff and moist.

Natural: Natural soils classified as silty CLAY with some sand and were noted to be stiff and moist. No groundwater was encountered in

Laboratory Tests

the excavations.

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis to determine in-place moisture/densities. These undisturbed samples consisted of one inch rings with inside diameter of 2.5 inches. Bulk bag samples were obtained in the upper soils for maximum density and R-Value tests.

- A. The field moisture content (ASTM:D 2216) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of borings.
- B. Maximum density tests (ASTM: D-1557-78) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.
- C. Resistance 'R' Value tests were conducted on representative soil samples to determine preliminary pavement section design for the proposed driveway areas. The results of our study are included later in this report.

Conclusions and Recommendations

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures will be safe from slippage and settlements under the anticipated design loadings and conditions. The proposed development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent structures.

It is recommended that site inspections be performed by a representative of this firm during future grading and construction of the development to verify the findings and recommendations documented in this report. Any unusual conditions which may be encountered in the course of the project development may require the need for additional study and revised recommendations.

Site Grading Recommendations

Any vegetation and demolition debris shall be removed and hauled from proposed grading areas prior to the start of grading operations. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. All grading operations shall be performed in accordance with the attached "Specifications for Compacted Fill Operations".

All upper fill soils (approximately 4 inches to 2 feet) shall be removed to competent native soils, the exposed surface scarified to a depth of 8 inches, brought to the proper moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557-78) prior to placement of any additional compacted fill soils, slabs-on-grade and pavement.

It is likely that isolated areas of undiscovered fill not described in this report are present on site. If found, these areas should be treated as discussed earlier. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed, properly abandoned or protected prior to the proposed construction.

Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the demolition and grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes should be provided at all times.

Temporary Excavations

Temporary unsurcharged excavations in the existing site materials may be made at vertical inclinations up to 4 feet in height and then may be trimmed at a 1 to 1(horizontal to vertical) gradient up to a maximum height of 10 feet. Cuts in excess of 10 feet must be assessed by this firm prior to excavation procedures. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring, slot-cutting, or flatter excavations may be required. The temporary cut slope gradients given above do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of CAL-OSHA and other public agencies having jurisdiction.

Pavement Design

Tests on the existing soils revealed an R-Value of 5. The following flexible pavement section design is provided based upon the lower of the test results. Using these values and various traffic indices, the following pavement design is provided for review.

Flexible (Asphalt) Pavement Section Design

Traffic	Inches	Inches
<u>Index</u>	<u>Asphalt</u>	<u>Base</u>
	4.0	
6.0	4.0	12.5
7.0	4.0	17.0
8.0	4.0	21.0

All subgrade soils shall be compacted to a minimum of 90% of the laboratory maximum dry density; base material shall be compacted to at least 95%.

Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This limited geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

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We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

No. 841

Exp. 12/31/00

Respectfully submitted,

NORCAL ENGINEERING

REGISTE

Keith D. Tucker Project Engineer

R.G.E. 841

WWW WWW Mark A. Burkholder Project Manager

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Preparation

Any existing low density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Soils Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-78).

Material For Fill

The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Soils Engineering firm a minimum of 24 hours prior to importation of site.

Placement of Compacted Fill Soils

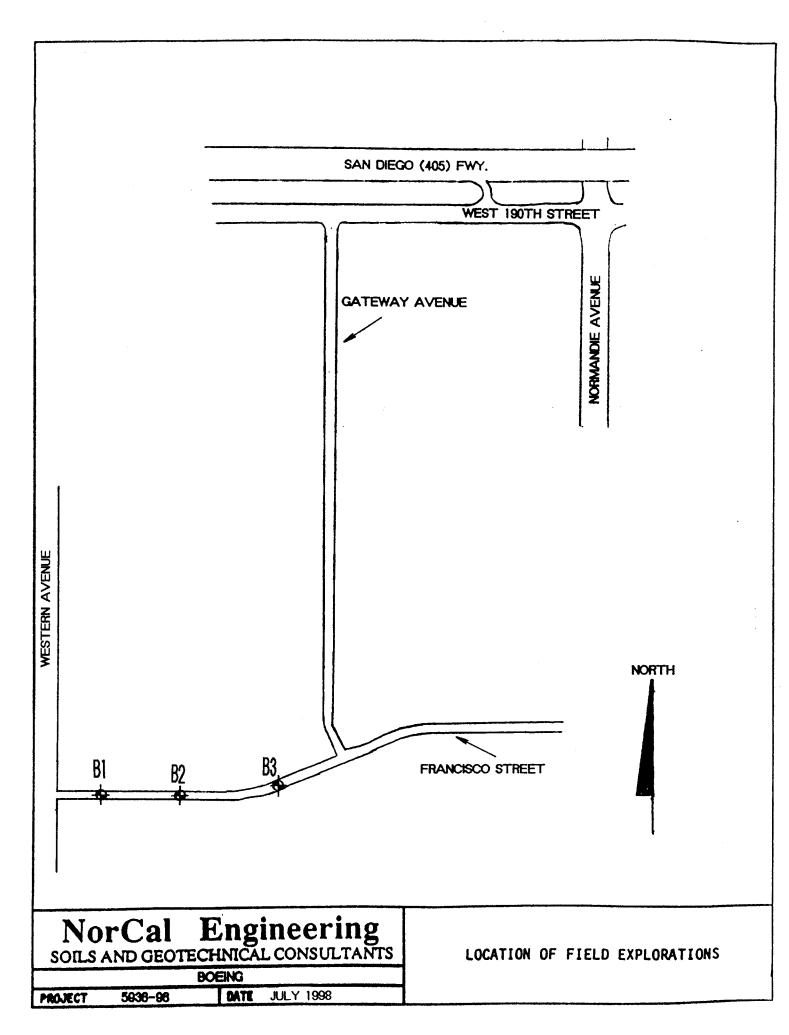
The approved fill soils shall be placed in layers not excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 15% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-78) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Soils Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Soils Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24 hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.



List of Appendices (In order of appearance)

Appendix A - Log of Excavations
Log of Trenches B1 to B3

Appendix B - Laboratory Analysis

Table I - Maximum Density R-Value Tests

APPENDIX A

MAJOR DIVISIONS		SMUBOLS		30L5	TYPICAL NAMES	
		CLEAN	0.00	300	GW	WELL GRAJED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES.
	GRAVELS	GRAVELS (UTTLE OR NO FINES)		9771174	GP	POORLY GRADED GRAVELS OR GRAVEL - SAND MIXTURES, LITTLE OR NO FINES.
	OF COARSE FRAC- TION IS LARGER THAN THE NO.4	GRAVELS WITH FINES	7078V.	STORY.	GM	SILTY GRAVELS, GRAVEL-SANO-SILT MIXTURES.
COARSE GRAINED	SIEVE SIZE)	(APPRECIABLE AMT. OF FINES)		K)	GC	CLAYEY GRAVELS, GRAVEL - SANO-CLAY MIXTURES
SOILS (MORE THAN 50% OF MATERIAL IS		CLEAN			SW	WE'L GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
SIEVE SIZE)	LARGER THAN 200 SIEVE SIZE) SANDS (MORE THAN 50% OF COARSE FRAC- TION IS SMALLER THAN THE NO.4 SIEVE SIZE)	SANDS	•		SP	POORLY GRADED SAMOS OR GRAVELLY SAMOS, LITTLE OR NO FIMES.
		SANDS WITH FINES (APPREGIABLE ANT. OF FINES)	•		SM	SILTY SANDS, SAND - SILT MIXTURES.
ŀ					SC	CLAYEY SANOS, SANO-GLAY MIXTURES.
					ML	INORGANIC SILTS' AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SETS WITH SLIGHT PLASTICITY.
FINE		ND CLAYS Less than 50)			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.
GRAINED SOILS					OL	OREANIC SILTS AND OREANIC SETY CLAYS
(MORE THAN 30% OF MATERIAL IS SMALLER THAN					MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SLTY SOLS, ELASTIC SILTS.
200 SIEVE SIZE		SILTS AND CLAYS			СН	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
·			Z		ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
HIGHLY ORGANIC SOILS					P1	PEAT AND OTHER HIGHLY ORGANIC SOILS

BOUNDARY CLASSIFICATIONS: SORS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS

NorCal Engineering SOILS AND GEOTECHNICAL CONSULTANTS

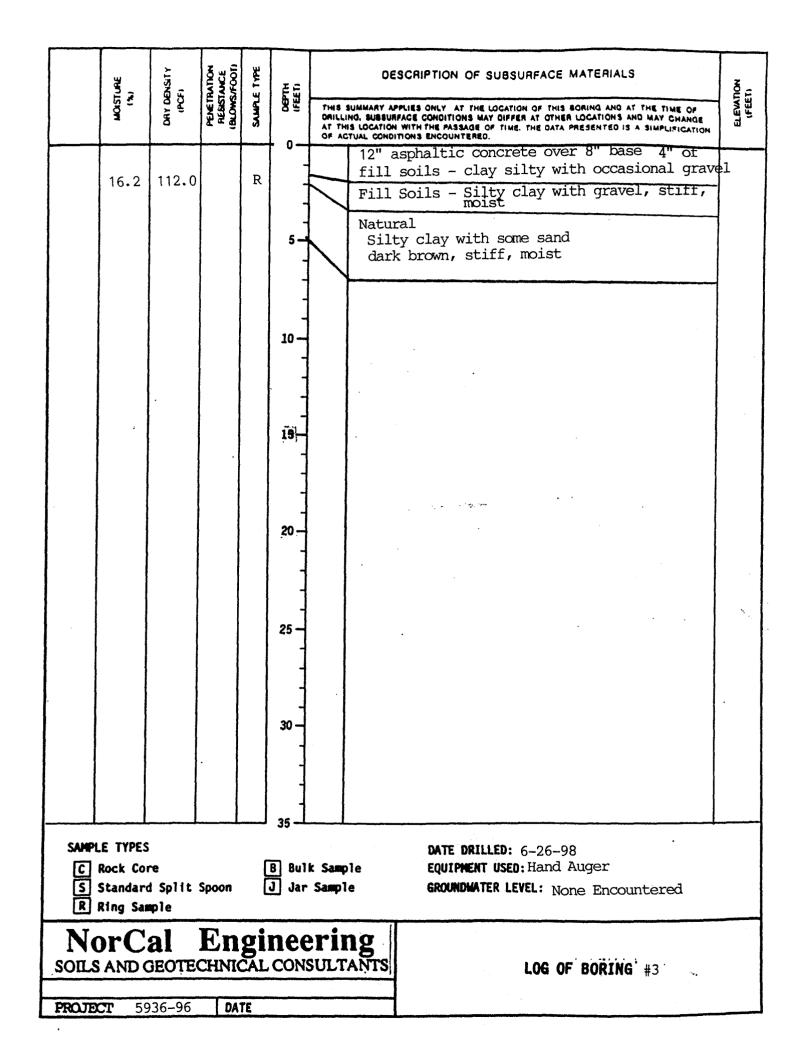
UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT

DATE

MOISTURE (%)	DAY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	O DEFTH	DESCRIPTION OF SUBSURFACE MATERIALS THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING, SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME, THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	ELEVATION (FEET)
			D	-	4 inches of asphaltic concrete over 8 inches of base material	
	2 108.6		R R	5	Fill Silty sandy CLAY with occasional gravel brown, stiff, and damp	i
				10 —	Natural Silty CLAY with sand, dark brown, stiff moist	
				19	Clayey silt yellow-brown, medium stiff, moist	
				20 -		
				25 —		
				30		•
C Rock S Stand	SAMPLE TYPES C Rock Core B Bulk Sample EQUIPMENT USED: Hand Auger S Standard Split Spoon J Jar Sample GROUNDWATER LEVEL: None Encountered R Ring Sample					
		En	CAL	nee .con	ering SULTANTS LOG OF BORING #1	
PROJECT	936–96	DA	TE			

	MOISTURE (%)	DAY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TIPE	O DEFTH	THIS SUMMARY APP ORILLING, SUBSURF AT THIS LOCATION OF ACTUAL CONDIT	SCRIPTION OF SUBSURFACE MATERIALS PLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF FACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION TIONS ENCOUNTERED.	ELEVATION (FEET)
	18.3	111.6	7/7 6/7	R	5 - 10 - 15	of bas Fill Silty brown Natura Silty dark	y clay with sand and occasional gravel m, stiff, damp	
			-		25 - 30 - 35			
C R S S R R	ing Sam	e Split : ple		<u>. </u>	J Jar	Sample Sample	DATE DRILLED: 6-26-98 EQUIPMENT USED: Simco 2800HS GROUNDWATER LEVEL: None Encountered	
No soils Projec			En CHNIC		cons	ring	LOG OF BORING' #2	



<u>APPENDIX B</u>

TABLE I MAXIMUM DENSITY TESTS (ASTM: D-1557-78)

Sample	Location	Optin Classification Mois	•
f	B1 @ 0-2'	Silty, sandy CLAY 16. with gravel	.5 113.0
11	B1 @ 2-3'	Silty, sandy CLAY 13.	5 118.0

'R' VALUE CA 301.

Client:

Norcal

Date:

7/9/98

Ву:

LD

Client's Job No.:

5939-96 (Boeing)

Sample No.: 5936-96_B-2 @ 2'-4'

AGRA Reference:

8-212-1002

Soil Type: D. Brown, Silty Clay

TEST SPECIMEN		Α	В	С	D
Compactor Air Pressure	psi	40	20	Hand	
Initial Moisture Content	%	7.5	7.5	7.5	
Water Added	ml	90	120	145	
Moisture at Compaction	%	15.6	18.3	20.5	
Sample & Mold Weight	gms	3270	3200	3118	
Mold Weight	gms	2102	2107	2084	
Net Sample Weight	gms	1168	1093	1034	
Sample Height	in.	2.67	2.6	2.51	
Dry Density	pcf	114.7	107.7	103.6	
Pressure	lbs	6240	4580	3160	
Exudation Pressure	psi	497	365	252	
Expansion Dial	x 0.0001	23	8	0	
Expansion Pressure	psf	100	35	0	
Ph at 1000lbs	psi	46	65	74	
Ph at 2000lbs	psi	116	145	< 160	
Displacement	turns	3.32	4.07	4.28	
R' Value		22	6	0	
Corrected 'R' Value		24	7	0	

FINAL 'R' VALUE						
By Exudation Pressure (@ 3	300.psi):	< 5				
By Epansion Pressure	:					
T‡ =		·				

'R' VALUE CA 301

Client:

Norcal

Date:

7/9/98

Ву:

LD

Client's Job No.:

5936-96 (Boeing)

Sample No.: 5936-96 _ B1 @ 2'-4'

AGRA Reference:

8-212-1002

Soil Type: D. Brown, Silty Clay

TEST SPECIMEN		Α	В	С	D
Compactor Air Pressure	psi	30	20	Hand	
Initial Moisture Content	%	8.2	8.2	8.2	
Water Added	ml	130	160	185	
Moisture at Compaction	%	19.9	22.6	24.9	
Sample & Mold Weight	gms	3202	3174	3145	
Mold Weight	gms	2110	2091	2091	
Net Sample Weight	gms	1092	1083	1054	
Sample Height	in.	2.63	2.62	2.54	
Dry Density	pcf	104.9	102.1	100.7	
Pressure	lbs	7220	4420	3080	
Exudation Pressure	psi	575	352	245	
Expansion Dial	x 0.0001	31	19	8	
Expansion Pressure	psf	134	82	35	
Ph at 1000lbs	psi	53	63	69	
Ph at 2000lbs	psi	136	>160	>160	
Displacement	turns	3.74	4.24	4.58	
R' Value		11	0	0	
Corrected 'R' Value		12	0	0	

FINAL 'R' \	/ALUE	
By Exudation Pressure (@ 3	300 psi):	< 5
By Epansion Pressure		
TI =		

